

**REBUTTAL TESTIMONY OF  
MATTHEW W. TANNER, Ph.D.**

**ON BEHALF OF  
SOUTH CAROLINA ELECTRIC & GAS COMPANY  
DOCKET NO. 2019-2-E**

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Matthew W. Tanner. My business address is 1200 19<sup>th</sup> St.  
3 NW, Suite 700, Washington, D.C. 20036.  
4

5 **Q. ARE YOU THE SAME MATTHEW W. TANNER WHO HAS**  
6 **PREVIOUSLY FILED TESTIMONY IN THIS DOCKET?**

7 A. Yes.  
8

9 **Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?**

10 A. The purpose of my rebuttal testimony is to respond on behalf of South  
11 Carolina Electric & Gas Company (“SCE&G” or the “Company”) to the  
12 direct testimony of 1) Mr. Brian Horii filed on behalf of the South Carolina  
13 Office of Regulatory Staff (“ORS”); 2) Mr. Taylor Norris filed on behalf of  
14 the South Carolina Solar Business Alliance (“SCSBA”); and 3) Mr. Brendan  
15 Kirby filed on behalf of the South Carolina Coastal Conservation League and  
16 the Southern Alliance for Clean Energy (collectively, “CCL/SACE”).

**REBUTTAL TO TESTIMONY OF MR. BRIAN HORII**

**Q. WITH RESPECT TO MR. HORII'S TESTIMONY, PLEASE EXPLAIN HOW YOU ORGANIZE YOUR RESPONSES.**

A. My rebuttal testimony sequentially addresses the issues raised by Mr. Horii as they appear in his direct testimony.

**Q. ON PAGE 19 OF HIS TESTIMONY, MR. HORII STATES THAT NAVIGANT'S METHODOLOGY FOR FORECASTING THE POTENTIAL SOLAR GENERATION DROP ESSENTIALLY PLACES INFINITE VALUE OF THE COST OF UNSERVED ENERGY. IS THIS A VALID CRITICISM OF NAVIGANT'S STUDY?**

A. No. Navigant's analysis did not use the absolute maximum in potential solar undergeneration to estimate the reserves that need to be held. Instead, the analysis used a threshold of rounding to 1% in order to avoid the most extreme events in the data set.

**Q. ON PAGE 22 OF HIS TESTIMONY, MR. HORII SUGGESTS THAT IT IS APPROPRIATE TO USE A THRESHOLD OF 2% FOR THE CHANCE OF SOLAR MISSING ITS FORECAST AS OPPOSED TO SCE&G'S THRESHOLD OF 1%. WHY IS IT APPROPRIATE TO USE A 1% THRESHOLD INSTEAD OF A 2% THRESHOLD?**

1 A. During the daylight hours, solar is capable of generating electricity  
2 approximately 4,000 hours per year. Using a 1% threshold as the estimate of  
3 solar uncertainty reflects an expectation that SCE&G would have an  
4 insufficient amount of generation due to unanticipated loss in solar  
5 generation approximately 30 to 50 hours per year. The timing of the forecast  
6 error cannot be predicted, however, and so it is appropriate to use relatively  
7 unlikely events as the basis for planning and determining the needed level of  
8 reserves to ensure that any undergeneration can be replaced. Navigant  
9 determined that assuming a 1% level of solar uncertainty is appropriate and  
10 provides the appropriate tradeoff between the cost of holding more reserves  
11 and mitigating the risk from undergeneration.

12  
13 **Q. ON PAGE 29 OF MR. HORII'S TESTIMONY, HE STATES A**  
14 **CONCERN THAT NAVIGANT'S MODELING OF RESERVES FOR**  
15 **AN ENTIRE DAY IS CONSERVATIVE. DOES THE MODELING**  
16 **ASSUMPTION OF MAINTAINING RESERVES THROUGHOUT**  
17 **THE DAY REFLECT A CONSERVATIVE BIAS?**

18 A. No, it does not. In nighttime hours, SCE&G has more than enough  
19 reserves available from thermal units that are operating at less than full  
20 capacity, which allows fast starting Combustion Turbines to be available for  
21 reserves during the night. The Fairfield Pumped Storage plant also would be  
22 available to provide reserves during these nighttime hours. Thus, in the hours

1       when the sun is not shining, the model shows that average held reserves is  
2       over 1,500 MW even when the model only required that 240 MW be held in  
3       the business-as-usual reserves case. This means that the additional reserves  
4       required for solar integration are not a binding constraint on the system in  
5       non-solar hours and thus do not materially impact the overall system  
6       operating costs or contribute to the calculation of the Variable Integration  
7       Charge (“VIC”).

8

9       **Q.   DO YOU BELIEVE THAT NAVIGANT’S APPROACH TO**  
10       **FORECASTING THE VIC IS TOO CONSERVATIVE OVERALL?**

11      A.       No. The study properly considers the tradeoff between risk of solar  
12       undergeneration and the likelihood of it occurring. The threshold used is  
13       appropriate for the VIC calculation. The reserve requirement modeling for  
14       the entire day is an aspect of modeling that does not conservatively bias the  
15       results because the make up of the SCE&G system is such that large numbers  
16       of reserves are always available overnight. The blending of cases with  
17       different reserve requirements properly accounts for the expected solar  
18       generation on different days.

19

**REBUTTAL TO TESTIMONY OF MR. NORRIS**

**Q. WITH RESPECT TO MR. NORRIS' TESTIMONY, PLEASE EXPLAIN HOW YOU ORGANIZE YOUR RESPONSES.**

A. In the same manner I responded to Mr. Horii's testimony, my rebuttal testimony sequentially addresses the issues raised by Mr. Norris as they appear in his direct testimony.

**Q. DOES MR. NORRIS' TESTIMONY SUGGEST THAT VARIABLE GENERATION DOES NOT ADD SYSTEM COSTS?**

A. No. There is nothing in Mr. Norris' testimony that suggests variability in solar generation does not increase utility operating costs. The purpose of the VIC study was to accurately estimate these costs without commenting on proper allocation of the additional costs to producers or consumers.

**Q. ON PAGE 23 OF HIS TESTIMONY, MR. NORRIS STATES THAT MORE "FLEXIBLE" APPROACHES TO SOLAR DEPLOYMENT MAY MITIGATE THE VARIABLE INTEGRATION CHARGE. HOW DO YOU RESPOND?**

A. Deploying solar generation in the manner suggested by Mr. Norris would require a significant change to their operation and would subject them to additional cost. If future solar generation that can be configured to provide a different level of guaranteed generation is added to SCE&G's system, it

1 would be appropriate to provide a different VIC calculation that reflects the  
2 more flexible generating characteristics of that class of resources. This type  
3 of flexibility currently is not available with the existing solar generation on  
4 SCE&G's system however. Accordingly, it is appropriate to calculate the  
5 VIC based on the generation characteristics of the solar that is currently  
6 interconnected with SCE&G's system and those that have executed PPAs  
7 with the Company.

8  
9 **REBUTTAL TO TESTIMONY OF MR. KIRBY**

10 **Q. WITH RESPECT TO MR. KIRBY'S TESTIMONY, PLEASE**  
11 **EXPLAIN HOW YOU ORGANIZE YOUR RESPONSES.**

12 A. In the same manner I responded to Mr. Horii's and Mr. Norris'  
13 testimony, my rebuttal testimony sequentially addresses the issues raised by  
14 Mr. Kirby as they appear in his direct testimony.

15  
16 **Q. ON PAGE 3 OF HIS DIRECT TESTIMONY AND ON PAGE 2 OF**  
17 **EXHIBIT BK-1, MR. KIRBY STATES THAT NAVIGANT'S**  
18 **ANALYSIS FAILS TO ACCOUNT FOR THE AGGREGATION**  
19 **BENEFITS THAT REDUCE FORECASTING ERRORS. IS THIS**  
20 **TRUE?**

21 A. No. In conducting an analysis of the appropriate VIC, it is very  
22 important to consider geographic diversity and aggregation benefits.

1 Navigant made sure to include these considerations into the study.  
2 Specifically, the study used four solar locations spread as widely as possible  
3 across the SCE&G territory. Because solar generation forecast error is  
4 weather driven, analyzing solar generation over such a wide geographic area  
5 properly accounts for the variability in weather throughout the territory. In  
6 my experience and given the relative compactness of SCE&G's service  
7 territory to those of other electric utilities, this is sufficient to capture the  
8 diversity benefits.

9  
10 **Q. ON PAGE 3 OF HIS DIRECT TESTIMONY AND ON PAGE 4 OF HIS**  
11 **EXHIBIT BK-1, MR. KIRBY STATES THAT NAVIGANT'S**  
12 **ANALYSIS USES AN EXCESSIVE 4-HOUR AHEAD FORECAST**  
13 **AND THUS FAILS TO INCLUDE COMBINED CYCLE ("CC")**  
14 **UNITS AS RESERVES. IS THIS TRUE?**

15 A. No. The 4-hour ahead forecast is appropriate to use. If SCE&G has a  
16 solar forecast at least 4 hours before operation, the Company has sufficient  
17 time to bring CC units online and plan for the expected amount of solar.  
18 However, the VIC study is looking at the reserves necessary to respond to  
19 forecast error and thus has to build in time for SCE&G to realize that the  
20 forecast is incorrect before mitigation can be started. For example, if SCE&G  
21 forecasts 500 MW of solar generation 4 hours before operation, the Company  
22 would commit its generating units based on the expectation that 500 MW of

1 solar will generate. If solar undergenerates its forecast, however, SCE&G  
2 operators would not be able to anticipate that undergeneration until much  
3 closer to actual operation. Therefore, SCE&G would not know that the CCs  
4 need to be started until it is clear that the solar forecast is incorrect, which  
5 likely would be within an hour or two of operation. Because there is not a  
6 sufficient amount of time to bring CC units online to replace this  
7 undergeneration, the offline CCs should not be accounted for in reserves.  
8

9 **Q. ON PAGE 3 OF HIS DIRECT TESTIMONY AND ON PAGE 5 OF**  
10 **EXHIBIT BK-1, MR. KIRBY STATES THAT NAVIGANT'S**  
11 **ANALYSIS IS TOO CONSERVATIVE BECAUSE RESERVE**  
12 **REQUIREMENTS ARE IMPOSED 8760 HOURS PER YEAR. DOES**  
13 **THIS BIAS THE ANALYSIS TO BE TOO CONSERVATIVE?**

14 A. No. For the same reasons I discussed in response to the direct  
15 testimony of Mr. Horii, Navigant's approach is not overly conservative and  
16 properly considers the tradeoff between risk of solar undergeneration and the  
17 likelihood of it occurring.  
18



1   **Q.    ON PAGE 4 OF HIS DIRECT TESTIMONY AND ON PAGE 9 OF HIS**  
2       **EXHIBIT BK-1, MR. KIRBY STATES THAT NAVIGANT’S**  
3       **ANALYSIS “FAILS TO RECOGNIZE THAT RESERVE**  
4       **SHORTFALL EVENTS WILL BE INFREQUENT AND ACTUAL**  
5       **SOLAR GENERATION SHORTFALLS WILL BE EVEN LESS**  
6       **FREQUENT AND THAT THE SHORTFALLS ARE RELATIVELY**  
7       **EASILY MITIGATED.” DO YOU AGREE?**

8    A.       No, I do not. SCE&G needs to plan for infrequent events to ensure  
9       that reliability is maintained. Navigant’s analysis appropriately considers the  
10      risk of solar generation shortfalls, which cannot be accurately predicted with  
11      sufficient time to bring needed units online to replace the shortfall. In order  
12      to ensure reliability is maintained, it therefore is necessary for SCE&G to  
13      have sufficient reserves available for these shortfalls.

14           It is true that these shortfalls can be relatively easily mitigated in the  
15      sense that SCE&G can certainly hold additional reserves or use other  
16      mitigation options without threatening the risk of reliability. However, these  
17      mitigation options come at an additional cost. The purpose of the VIC study  
18      is to estimate these costs to the system to ensure that the solar generation  
19      shortfalls are being appropriately planned for.

20

1   **Q.    ON PAGE 4 OF HIS DIRECT TESTIMONY AND ON PAGE 11 OF**  
2       **EXHIBIT BK-1, MR. KIRBY STATES THAT NAVIGANT’S**  
3       **ANALYSIS DOES NOT INCLUDE SIGNIFICANT ADDITIONAL**  
4       **RESERVES FROM THE FAIRFIELD PUMPED STORAGE PLANT**  
5       **AND FROM INTERRUPTIBLE LOAD. ARE THERE ADDITIONAL**  
6       **RESERVES FROM THESE SOURCES THAT WERE NOT**  
7       **INCLUDED?**

8    A.       No. As I discussed in my direct testimony, PROMOD allowed the  
9       Fairfield Pumped Storage plant to change its operation to minimize overall  
10      system cost while meeting the requirements for solar integration.  
11      Accordingly, the model used in the study configured Fairfield to provide  
12      reserves both when it is pumping and when it is offline. Regarding  
13      interruptible load, and as discussed in the rebuttal testimony of Company  
14      Witness Bell, the Company believes that relying upon interruptible load to  
15      meet daily operating reserve requirements would significantly increase the  
16      number of curtailments and result in substantial additional economic impacts  
17      to interruptible customers.

18           In reviewing this issue, however, Navigant determined that the  
19      calculation file of all hourly operation provided in discovery was outdated  
20      and contained an error that did not properly reflect the actual reserves  
21      available. This error occurred after the analysis was conducted and did not  
22      impact the modeling, the calculation of the VIC, or the results of the study.

1           The Company has updated its discovery responses to provide a corrected  
2           copy of this calculation file.

3

4   **Q.   ON PAGE 13 OF EXHIBIT BK-1, MR. KIRBY STATES THAT “ALL**  
5   **NEW SOLAR PLANTS GREATER THAN ~1 MW COULD BE**  
6   **EASILY PLACED ON AUTOMATIC GENERATION CONTROL”**  
7   **AS A MITIGATION OPTION. WOULD THIS PROVIDE THE**  
8   **NECESSARY RESERVES AT A LOWER COST THAN ESTIMATED**  
9   **BY NAVIGANT?**

10   **A.**           No. Placing new solar plants on automatic generation control does not  
11           mitigate the risk of forecast error in solar generation unless the solar facilities  
12           are operated to provide upward and downward flexibility. However, the  
13           current solar facilities on SCE&G’s system not operated in this manner and,  
14           as I discussed earlier in responding to the testimony of Mr. Norris, doing so  
15           would come at the cost of reduced generation from the facility.

16

1   **Q.    ON PAGE 14 OF EXHIBIT BK-1, MR. KIRBY ASKS WHETHER**  
2       **“NEW THERMAL GENERATORS WOULD BE ASSESSED AN**  
3       **INTEGRATION CHARGE FOR HIGH MINIMUM LOAD OR LONG**  
4       **STARTUP TIME.” IF THESE CHARACTERISTICS CAUSED A**  
5       **COST TO THE SYSTEM, WOULD SUCH A CHARGE BE**  
6       **APPROPRIATE?**

7    A.       QFs are paid SCE&G’s avoided costs. These costs appropriately  
8       include savings to SCE&G from energy and capacity that does not need to  
9       be procured due to the characteristics of the QF. They also appropriately  
10      include any costs to SCE&G from having to operate the system differently  
11      to ensure reliability when taking energy from the QFs. The additional system  
12      operating costs from solar installations is what is captured in the VIC.

13           Similar to solar QFs, if sufficient thermal QFs were being constructed  
14      to significantly impact the rest of the system, it would be appropriate to  
15      consider all of their operating characteristics and impact on the system when  
16      calculating their avoided costs.

17           Assuming SCE&G were to construct a new thermal unit with  
18      operating characteristics that would result in increased operating costs due to  
19      high minimum load or long start-up time, it would be appropriate to include  
20      these costs in system planning. SCE&G does this when evaluating what  
21      resources might need to be added. Imbedded in the analysis of the cost and  
22      value of new resources is a system simulation that forecasts future system

1 operation and costs. Resources are properly evaluated based on their overall  
2 impact to system costs including both capital costs and system operating cost.

3

4 **Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?**

5 A. Yes.